North-Central Section - 54th Annual Meeting - 2020

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FLOW BANDS AND MICROLITE TEXTURES IN OBSIDIAN, MINYON FALLS RHYOLITE, AUSTRALIA

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Flow bands composed of variable concentrations of small (< 50 micron), acicular crystals called microlites are common features of silicic lava flows and domes. To investigate the timing and location of band formation during effusive emplacement of rhyolite, we examined microlite textures in flow-banded obsidian from the Minyon Falls Rhyolite, a 1.25 km^3 lava dome in eastern Australia. The well-exposed basal obsidian of the middle Miocene dome contains dark-colored bands of microlite-poor brown glass and light-colored bands of microlite-rich colorless glass. The size, orientation, and number density of clinopyroxene microlites in both light and dark bands were determined by focusing into rectangular volumes of transparent thin-sections of obsidian using a petrographic microscope. Textural measurements were made for four to nine individual bands within each thin-section for samples collected from flow-front and near-vent locations. Measured band thickness ranges from 45 microns to 6 mm and microlite number densities (MND) range from about 10^7 to 10^9 cm^{-3}. Most of this range is present at the scale of a single thin section. In general, bands with higher MND have smaller average crystal sizes and steeper (negative) slopes on crystal sized distribution (CSD) plots, compared to bands with lower microlite number density. However, none of the microlite properties correlate with band thickness, degree of microlite preferred orientation, or stratigraphic position within the basal shear zone. This observation indicates that microlite-defined flow bands primarily form during magma ascent; most microlites are apparently unable to nucleate or grow appreciably during flow on the surface. Therefore, while observed microlite preferred orientations may reflect re-orientation during emplacement (at least at the base of active lava flows), microlite number densities and size distributions record conduit processes. Given that number densities and size distributions of microlites vary widely on the scale of a thin-section, we conclude that individual flow bands provide a record of spatially complex variations in ascent rate and residence time during transport in shallow volcanic conduits.

Session No. 29--Booth# 20

T4. Petrology, Mineralogy, and High-Temperature Geochemistry (Posters)
Tuesday, 19 May 2020: 8:30 AM-5:30 PM

Lake Superior Ballroom KJ (Duluth Entertainment Convention Center)

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